

CLAIMS

1. A method for converting a halftone image in which each pixel takes one of two binary values, into an image in which each pixel takes a continuous value, comprising:
- for each pixel, defining a respective neighborhood containing that pixel and other pixels;
  - in a first iteration, obtaining for each individual pixel a continuous value as a weighted sum of the binary values of the pixels in the neighborhood of the individual pixel, the weighting values being derived from the binary values of the halftoned image; and
  - in further iterations, obtaining for each individual pixel a continuous value as a weighted sum of the continuous values of the pixels in the neighborhood of the individual pixel obtained at the previous iteration, the weighting values being derived from the continuous values obtained in at least one previous said iteration.
2. A method for converting a halftone image having a halftone value for each of a plurality of pixels, into a reconstructed image which for each of said pixels takes more than two values, comprising for successive individual pixels:
- defining a set of neighborhood pixels of the individual pixel, the set of neighborhood pixels including the individual pixel and additionally a plurality of pixels proximate said individual pixel;
  - deriving for each pixel of the neighborhood, a significance coefficient; and
  - deriving the reconstructed value of the individual pixel as a sum over the pixels of the neighborhood of a product of the halftone image value at that neighborhood pixel with the significance coefficient of that neighborhood pixel.
3. A method according to claim 1 in which said halftone image is derived from an original image having a continuous value for each pixel, and, for each individual pixel, said significance coefficient of each neighborhood pixel is an indication of the likelihood that the value of that neighborhood pixel in the original image is correlated with the value of the individual pixel in the original image.
4. A method according to claim 2 in which, for each individual pixel, said step of deriving a significance coefficient for each neighborhood pixel includes: deriving a

~~baseline value for the individual pixel, and deriving said significance coefficient as a function of the halftone value for the image at that neighborhood pixel and of the baseline value for the individual pixel.~~

5. A method according to claim 4 in which the baseline value for the individual pixel is derived by low pass filtering of the halftone image.

6. A method according to claim 5 in which, for each individual pixel, the significance coefficient for each neighborhood pixel is a decreasing function  $f(v)$  of the absolute difference  $(v)$  between the halftone value at that neighborhood pixel and the baseline value for the individual pixel.

7. A method according to claim 6 in which  $f(v)$  is a non-linear function.

8. A method according to claim 6 in which  $f(v)$  is a continuous function.

9. A method according to claim 8 in which  $f(v)$  is a function of the form  $f(v) = a(1 - v/b)^k$  where  $a$  and  $b$  are predefined numbers and  $k$  is a predefined integer.

10. A method according to claim 8 in which  $f(v)$  is a function of the form  $f(v) = a(1 - v/b_1)(1 - v/b_2) \dots (1 - v/b_k)$ , where  $a$  is a predefined number,  $k$  is a predefined integer,  $\{b_k\}$  are a set of  $k$  predetermined numbers.

11. A method according to claim 2 comprising a further step of forming an enhanced reconstructed image as a linear combination of said reconstructed image and a continuous image derived from said halftone image by a second image reconstruction method.

12. A method according to claim 11 in which said second image reconstruction method is a low pass filter.

13. A method for converting a halftone image having a binary value for each of a plurality of pixels, into a reconstructed image which for each of said pixels takes more than two values, comprising for successive individual pixels:

defining a set of neighborhood pixels of the individual pixel, the set of neighborhood pixels including the individual pixel and additionally a plurality of pixels proximate said individual pixel;

5 deriving for each pixel of said first neighborhood, a respective significance coefficient; and

deriving a first reconstructed value of the individual pixel as a sum over the neighborhood pixels of a product of the halftone image value at that neighborhood pixel with the respective significance coefficient of that neighborhood pixel; and

M further steps,  $m=1, \dots, M$  ( $M \geq 1$ ), of:

10 for successive individual ones of said pixels:

rederiving a significance coefficient for each neighborhood pixel; and

deriving an  $(m+1)$ -th reconstructed value of the individual pixel as a sum over the neighborhood pixels of the product of the  $m$ -th reconstructed value at that neighborhood pixel with the significance coefficient of that neighborhood pixel.

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14. A method for converting a halftone image having a halftone value for each of a plurality of pixels, into a reconstructed image which for each of said pixels takes more than two values, comprising:

20 preprocessing the halftone image by a filtering algorithm to derive a preprocessed image having a preprocessed image value for each of said pixels; and

for successive individual pixels:

(i) defining a set of neighborhood pixels of the individual pixel, the set of neighborhood pixels including the individual pixel and additionally a plurality of pixels proximate said individual pixel;

25 (ii) deriving for each pixel of the neighborhood, a significance coefficient; and

(iii) deriving the reconstructed value of the individual pixel as a sum over the pixels of the neighborhood of a product of the preprocessed image value at that neighborhood pixel with the significance coefficient of that neighborhood pixel.

30 15. A method according to claim 14 in which, for each individual pixel, said step of deriving a significance coefficient for each neighborhood pixel includes: deriving a baseline value for the individual pixel, and deriving said significance coefficient as a function of the preprocessed value for the image at that neighborhood pixel and of the baseline value for the individual pixel.

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16. A method for enhancing first image having a first value for each of a plurality of pixels, into an enhanced image, comprising for successive individual pixels:

defining a set of neighborhood pixels of the individual pixel, the set of neighborhood pixels including the individual pixel and additionally a plurality of pixels proximate said individual pixel;

deriving for each pixel of the neighborhood, a significance coefficient; and

deriving the reconstructed value of the individual pixel as a sum over the pixels of the neighborhood of a product of the first value at that neighborhood pixel with the significance coefficient of that neighborhood pixel.

17. A method for enhancing a first image having a first value for each of a plurality of pixels to form an enhanced image, comprising:

preprocessing the first image by a filtering algorithm to derive a preprocessed image having a preprocessed image value for each of said pixels; and

for successive individual pixels:

(i) defining a set of neighborhood pixels of the individual pixel, the set of neighborhood pixels including the individual pixel and additionally a plurality of pixels proximate said individual pixel;

(ii) deriving for each pixel of the neighborhood, a significance coefficient; and

(iii) deriving the reconstructed value of the individual pixel as a sum over the pixels of the neighborhood of a product of the preprocessed image value at that neighborhood pixel with the significance coefficient of that neighborhood pixel.

18. A computer program product which is readable by a computing device to cause the computing device to perform a method according to claim 1.

19. A computer program product which is readable by a computing device to cause the computing device to perform a method according to claim 2.

20. A computer program product which is readable by a computing device to cause the computing device to perform a method according to claim 13.

21. A computer program product which is readable by a computing device to cause the computing device to perform a method according to claim 14.

DATE	TIME	REMARKS	NO.
1900	10:00	Left camp for the first time.	1
1900	10:30	Arrived at the first station.	2
1900	11:00	Left the first station.	3
1900	11:30	Arrived at the second station.	4
1900	12:00	Left the second station.	5
1900	12:30	Arrived at the third station.	6
1900	13:00	Left the third station.	7
1900	13:30	Arrived at the fourth station.	8
1900	14:00	Left the fourth station.	9
1900	14:30	Arrived at the fifth station.	10
1900	15:00	Left the fifth station.	11
1900	15:30	Arrived at the sixth station.	12
1900	16:00	Left the sixth station.	13
1900	16:30	Arrived at the seventh station.	14
1900	17:00	Left the seventh station.	15
1900	17:30	Arrived at the eighth station.	16
1900	18:00	Left the eighth station.	17
1900	18:30	Arrived at the ninth station.	18
1900	19:00	Left the ninth station.	19
1900	19:30	Arrived at the tenth station.	20
1900	20:00	Left the tenth station.	21
1900	20:30	Arrived at the eleventh station.	22
1900	21:00	Left the eleventh station.	23
1900	21:30	Arrived at the twelfth station.	24
1900	22:00	Left the twelfth station.	25
1900	22:30	Arrived at the thirteenth station.	26
1900	23:00	Left the thirteenth station.	27
1900	23:30	Arrived at the fourteenth station.	28
1900	24:00	Left the fourteenth station.	29
1900	24:30	Arrived at the fifteenth station.	30
1900	25:00	Left the fifteenth station.	31
1900	25:30	Arrived at the sixteenth station.	32
1900	26:00	Left the sixteenth station.	33
1900	26:30	Arrived at the seventeenth station.	34
1900	27:00	Left the seventeenth station.	35
1900	27:30	Arrived at the eighteenth station.	36
1900	28:00	Left the eighteenth station.	37
1900	28:30	Arrived at the nineteenth station.	38
1900	29:00	Left the nineteenth station.	39
1900	29:30	Arrived at the twentieth station.	40
1900	30:00	Left the twentieth station.	41
1900	30:30	Arrived at the twenty-first station.	42
1900	31:00	Left the twenty-first station.	43
1900	31:30	Arrived at the twenty-second station.	44
1900	32:00	Left the twenty-second station.	45
1900	32:30	Arrived at the twenty-third station.	46
1900	33:00	Left the twenty-third station.	47
1900	33:30	Arrived at the twenty-fourth station.	48
1900	34:00	Left the twenty-fourth station.	49
1900	34:30	Arrived at the twenty-fifth station.	50
1900	35:00	Left the twenty-fifth station.	51
1900	35:30	Arrived at the twenty-sixth station.	52
1900	36:00	Left the twenty-sixth station.	53
1900	36:30	Arrived at the twenty-seventh station.	54
1900	37:00	Left the twenty-seventh station.	55
1900	37:30	Arrived at the twenty-eighth station.	56
1900	38:00	Left the twenty-eighth station.	57
1900	38:30	Arrived at the twenty-ninth station.	58
1900	39:00	Left the twenty-ninth station.	59
1900	39:30	Arrived at the thirtieth station.	60
1900	40:00	Left the thirtieth station.	61
1900	40:30	Arrived at the thirty-first station.	62
1900	41:00	Left the thirty-first station.	63
1900	41:30	Arrived at the thirty-second station.	64
1900	42:00	Left the thirty-second station.	65
1900	42:30	Arrived at the thirty-third station.	66
1900	43:00	Left the thirty-third station.	67
1900	43:30	Arrived at the thirty-fourth station.	68
1900	44:00	Left the thirty-fourth station.	69
1900	44:30	Arrived at the thirty-fifth station.	70
1900	45:00	Left the thirty-fifth station.	71
1900	45:30	Arrived at the thirty-sixth station.	72
1900	46:00	Left the thirty-sixth station.	73
1900	46:30	Arrived at the thirty-seventh station.	74
1900	47:00	Left the thirty-seventh station.	75
1900	47:30	Arrived at the thirty-eighth station.	76
1900	48:00	Left the thirty-eighth station.	77
1900	48:30	Arrived at the thirty-ninth station.	78
1900	49:00	Left the thirty-ninth station.	79
1900	49:30	Arrived at the fortieth station.	80
1900	50:00	Left the fortieth station.	81
1900	50:30	Arrived at the forty-first station.	82
1900	51:00	Left the forty-first station.	83
1900	51:30	Arrived at the forty-second station.	84
1900			

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for each pixel, defining a respective neighborhood containing that pixel and other pixels;

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